

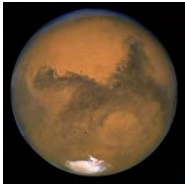


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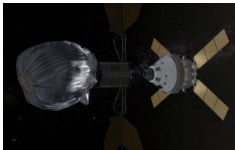
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Marshall Space Flight Center, Alabama 35812
256-544-0030
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Manager of Public and Employee Communications: June E. Malone (acting)
Editor: Jenalane Rowe

Move Over Heavy Metal, There's A New Tank in Town

By Tracy McMahan

For more than 50 years, metal tanks have carried fuel to launch rockets and propel them into space, but one of the largest composite tanks ever manufactured may change all that. The tank -- known as the composite cryotank -- arrived at NASA's Marshall Space Flight Center on March 26 inside the belly of NASA's Super Guppy, a large wide-bodied cargo airplane. Now, engineers are preparing the tank for a series of tests.

See **Composite Cryotank** on [page 2](#)



Upon completion of manufacturing at the Boeing Developmental Center in Tukwila, Wash., the tank was loaded into NASA's Super Guppy, a wide-bodied cargo aircraft and delivered to Marshall. The Super Guppy has a hinged nose that opens and allows large cargos like the tank to be easily unloaded. (NASA/MSFC/Emmett Given)

All Systems Go for NASA's New Human Exploration Rover Challenge April 10-12

By Bill Hubscher

The air around the U.S. Space & Rocket Center will be charged with anticipation next week as the museum is transformed into NASA's latest and greatest challenge for high school and college students: the Human Exploration Rover Challenge.

Students representing nearly 90 teams from around the world will descend on the Rocket City April 10-



12 to test their engineering skills in this brand new competition, which evolved from the 20-year legacy of NASA's Great Moonbuggy Race.

See **Rover Challenge** on [page 3](#)

Composite Cryotank *Continued from page 1*

“NASA is focusing on composite tank technology because it is a high-payoff technology that can bring down both the cost and weight of launch vehicles and other spacecraft,” said Preston Jones, deputy director of Marshall’s Engineering Directorate. “Game changing technologies like this innovative tank will enable NASA to explore deep space in an affordable manner.”

The composite cryotank is part of NASA’s [Game Changing Development Program](#) and [Space Technology Mission Directorate](#), which is innovating, developing, testing and flying hardware for use in NASA’s future missions. Before these advanced technologies become part of a space mission, it is crucial to test them on the ground. That’s why this summer the 18-foot-diameter (5.5 meter) composite tank will be filled with approximately 28,000 gallons (105,992 liters) of liquid hydrogen and tested at extreme pressures and temperatures similar to those experienced during spaceflight.

“Advances in composite materials and manufacturing offer some of the greatest potential for improvements in cost, schedule and overall performance for a wide range of NASA missions,” said John Vickers, project manager for the [Composite Cryotank and Technologies Demonstration project](#) at the Marshall Center. “We have improved composite manufacturing without adding risks or costs to any of NASA’s current projects. We want to advance this technology, so tanks are ready as NASA’s [Space Launch System](#) -- the largest most powerful rocket ever built -- evolves.”

A team of engineers from the Boeing Co. and NASA designed and manufactured the tank at the Boeing Developmental Center in Tukwila, Wash. NASA experts learned from prior tank designs and testing and helped devise ways to combat imperfections such as microscopic leaks, found in previous composite tanks. The team leveraged Boeing’s experience producing composites for aircraft to use a unique fiber-placement technique and new materials that did not require expensive curing processes in autoclaves, procedures traditionally associated with composite production.

“Our team was made up of composites experts across NASA and Boeing,” said John Fikes, deputy project manager for the composite cryotank at the Marshall Center. “We worked together to tweak the tank



NASA engineers inspect and prepare one of the largest composite rocket propellant tanks ever manufactured for testing. The outer shell of the 18-foot-diameter (5.5-meter) cryotank is the same size as propellant tanks used on today’s full-size rockets. (NASA/MSFC/Fred Deaton)

design and improve it along the way. We are looking forward to using Marshall’s unique hydrogen test facilities to understand the tank’s capabilities.”

Marshall engineers are preparing the tank for testing at a test stand recently used for structural tests of the SLS adapter ring. Here, the tank will come to life as it is filled with liquid hydrogen, cooled and pressurized. As it undergoes this endurance testing, NASA and Boeing engineers will monitor data to see how it performs compared to metal tanks and the smaller 8-foot-diameter (2.4-meter) tank tested at Marshall last summer. Engineers will be working in a new centralized control room, which is shared by several test facilities and has updated video, data acquisition and communications systems.

McMahan is a public affairs officer in the Office of Strategic Analysis & Communications.

Mars Viewing: Planet Makes Close Approach to Earth in April

Dust off your telescope and prepare for a spectacular viewing opportunity of Mars in the night sky. The Earth is now orbiting between the sun and Mars, with optimal viewing April 8 and for several weeks around that time.

During this period, Mars will be at its brightest and best fiery red color as it rises in the east when the sun is setting in the west. Mars rises in the east at mid-to-late evening. Mars will be shining from dusk till dawn.

Now is a good time to start watching for Mars in the night sky. Mars will look like a bright red star, although it shines with a steadier light than the twinkling stars.

Also, make a note on April 13 and 14 on your calendar: A bright waxing gibbous moon will pair up with the red planet on the night of [April 13](#) and the totally eclipsed full moon will couple up with Mars on the night of [April 14](#).



Mars with its mysterious dark markings and a white polar cap will be easily visible in April's night sky. (NASA)

Rover Challenge *Continued from [page 1](#)*

The Marshall Centers' Academic Affairs Office, which organizes the event for NASA, restructured the challenge to encourage future engineers to look beyond the moon. The vehicles and teams will still face a rugged course on the grounds of the U.S. Space & Rocket Center, but the obstacles will attempt to mimic the terrains of other planets, moons and even asteroids and comets.

Students must design robust and durable rovers with the traction to scale new obstacles and meet new challenges. The complete list of rules, participating teams and prizes to be awarded can be found on the [Rover Challenge website](#).

The challenge is more than just spirited competition, as the students' creations could potentially inform the design process for NASA's next generation space transportation systems. It also continues NASA's efforts to use the appeal and intrigue of its space missions and programs as

catalysts for engaging students in hands-on STEM – science, technology, engineering and mathematics.

Fans and family members can follow the action during the weekend by visiting the Rover Challenge social media channels listed below. Marshall Television also will provide a high-definition video stream and live commentary of the event from the U.S. Space & Rocket Center.

Facebook: www.facebook.com/roverchallenge

Twitter: www.twitter.com/roverchallenge using #RoverChallenge

Instagram: www.instagram.com/NASA_Marshall using #RoverGram

Ustream: <http://www.ustream.tv/channel/nasa-msfc>

Hubscher, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Asteroid Initiative Opportunities Forum Highlights Progress, Public Participation

From NASA web feature

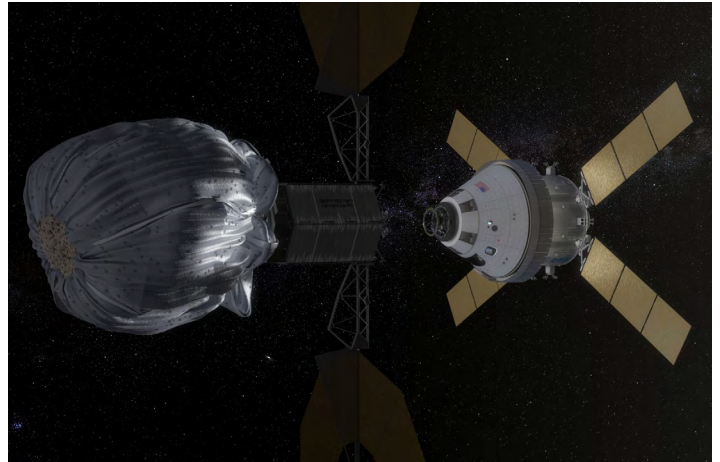
NASA officials discussed the latest progress and new opportunities in the agency's Asteroid Initiative in a March 26 forum with members of the aerospace industry, academia and space enthusiasts. The forum followed a March 21 [Broad Agency Announcement](#) calling for additional mission concept studies led outside of NASA, with \$6 million in potential awards.

NASA's Asteroid Initiative is comprised of an Asteroid Grand Challenge to develop new partnerships and collaborations to accelerate NASA's existing planetary defense work, and a mission to capture and redirect an asteroid and visit it with astronauts to collect samples.

NASA refers to the latter effort to identify, redirect and send astronauts to explore an asteroid as the "Asteroid Redirect Mission." This mission has three major elements: target identification, characterization and selection; a robotic mission to capture and redirect the selected asteroid into a stable orbit above the moon; and a crewed mission segment in which astronauts in the Orion spacecraft launched aboard the [Space Launch System](#) rocket will rendezvous with the captured asteroid, conduct spacewalks to collect samples from it, and return them to the Earth for analysis.

"Our Asteroid Initiative is part of a stepping stone approach focused on meeting the president's bold challenge of sending humans to Mars in the 2030s," said NASA Administrator Charles Bolden. "The Asteroid Redirect Mission will help us develop technologies, including solar electric propulsion, needed for future deep space missions; and the Grand Challenge includes enhanced Near Earth Object (NEO) detection and characterization, which will extend our understanding of NEO threats while providing additional opportunities for investigation of asteroids and demonstrations of technologies and capabilities."

Following Bolden's welcome remarks, astronaut Karen Nyberg, who recently completed a six-month stay aboard the International Space Station, stressed the importance of the space station as a feat of



This conceptual image shows NASA's Orion spacecraft, which will be launched by the SLS, approaching the robotic asteroid capture vehicle. The trip from Earth to the captured asteroid will take Orion and its two-person crew an estimated nine days. (NASA)

international collaboration and a cornerstone for future, farther exploration into space.

"I know everybody here at NASA is extremely excited to hear your ideas on how we can go forward with the Asteroid Initiative with the ultimate goal of taking us -- the world population -- farther into the solar system," said Nyberg.

Mission Concept Study Updates

In a six-panel lineup, leading NASA experts described ongoing concept studies for the Asteroid Redirect Mission, starting with near-Earth object observation efforts to identify viable candidates for the mission. Mission concept leads Brian Muirhead of NASA's Jet Propulsion Laboratory and Dan Mazanek of NASA's Langley Research Center explained the leading asteroid capture concepts. One would use an inflatable bag to envelop a small, free-flying asteroid.

In both cases, the target asteroid would already be on a trajectory that comes near the Earth-moon system. A redirect vehicle powered by advanced solar-electric propulsion would use thrusters to slowly push the asteroid to a new position: a distant retrograde lunar orbit. Both concepts would also demonstrate basic planetary defense techniques

See [Asteroid Initiative](#) on [page 5](#)

SERVIR Team Hosts First Bootcamp

At the first SERVIR Geospatial Information Technology “bootcamp,” Albert Anoubon-Momo, of the US Agency for International Development (USAID), gestures as he discusses the challenges and opportunities of sharing Earth Science data in developing countries with SERVIR teams from Central America, Africa and the Hindu Kush Himalaya regions at the National Space Science and Technology Center. Goals for the bootcamp were to improve the ability to develop geospatial information technology in SERVIR applications and formalize a community of practice. The SERVIR program, jointly funded by NASA and USAID, is part of the Earth Science Division’s Applied Sciences Program in NASA’s Science Mission Directorate in Washington. Four other NASA field centers work with NASA’s Marshall Space Flight Center on the program. For more information about SERVIR, visit: <http://www.nasa.gov/servir> or <http://servirglobal.net/>. (NASA/MSFC/Emmett Given)



Asteroid Initiative *Continued from page 4*

to determine if they could be used to defend the planet in the case of a potential catastrophic asteroid collision with Earth.

Once in a stable lunar orbit, NASA would send astronauts aboard the [Space Launch System](#) and Orion spacecraft to visit the asteroid. This unprecedented mission would take humans farther into deep space than ever before.

Opportunities for Involvement

A panel dedicated to the Broad Agency Announcement opportunity featured systems experts who explained details of the [five-part solicitation](#). Notices of intent for the Broad Agency Announcement are due April 4 and proposals are due May 5. Contracts are expected to begin July 1 and conclude Dec. 31, 2014.

Jason Kessler, the program executive for NASA’s Asteroid Grand Challenge, highlighted current activities and announced a new partnership with SpaceGAMBIT that will focus on how the Maker community can engage with the challenge to find all asteroid threats to human population and know what to do about them.

NASA Associate Administrator Robert Lightfoot concluded the event, noting that teams working on

the two Asteroid Redirect Mission concepts have been consolidated into one team, and the agency is beginning to assign work on the mission concepts to NASA centers in advance of a mission concept review.

“It’s pretty exciting for me to stand here and think about how far the team has come in just a year developing these capabilities to do this mission, but also to make sure that all the things we’re working on are extensible to our real destination, which is Mars,” said Lightfoot.

Lightfoot added he expects the Asteroid Redirect Mission to cost roughly half of the approximate \$2.6 billion originally estimated in the Keck Institute for Space Studies Asteroid Retrieval Feasibility Study, released in 2012.

For the latest information about NASA’s Asteroid Initiative, visit [here](#).

Watch a one-minute video of Asteroid Redirect Mission highlights featuring concepts of capturing an asteroid by encapsulation and robotically collecting a boulder from its surface [here](#).

Super Guppy's Special Delivery Featured on NASA-TV

The recent delivery of a new composite cryogenic fuel tank by the massive Super Guppy cargo plane to the Marshall Space Flight Center for a series of tests is featured in the latest edition of “[This Week @NASA](#),” a weekly video program broadcast nationwide on NASA-TV and posted online. You can watch this and previous episodes of This Week @NASA at the [NASA-TV YouTube channel](#).



Obituaries

Janell Morrow Smith, 79, of Arab, died March 20. She retired from the Marshall Center in 1988 as a secretary.

William Boshers, 80, of Madison, died March 22. He retired from the Marshall Center in 1981 as an engineering technician.

Ricky Humphries, 59, of Red Bay, died March 22. He retired from the Marshall Center in 2011 as a data systems engineer. He is survived by his wife, Sheree Davis Humphries.

Charles R. Perry, 83, of Laurel, Miss., died March 30. He retired from the Marshall Center in 1989 as a personnel officer. He is survived by his wife, Lillian M. Perry.